

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)	
)	
Inquiry Regarding Carrier Current Systems,)	ET Docket No. 03-104
including Broadband over Power Line Systems)	
)	
)	

NOTICE OF INQUIRY

Adopted: April 23, 2003

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By the Commission: Chairman Powell, Commissioners Abernathy, Martin, and Adelstein issuing separate statements; Commissioner Copps approving in part, concurring in part, and issuing a statement.

Comment date: [45 days from publication in Federal Register]

Reply comment date: [75 days from publication in Federal Register]

I. INTRODUCTION

1. The Commission is initiating this inquiry to obtain information on a variety of issues related to Broadband over Power Line (BPL) systems. BPL systems are new types of carrier current system that operate on an unlicensed basis under Part 15 of the Commission's rules. BPL systems use existing electrical power lines as a transmission medium to provide high-speed communications capabilities by coupling RF energy onto the power line. Because power lines reach virtually every community in the country, BPL could play an important role in providing additional competition in the offering of broadband infrastructure to the American home and consumers. In addition, BPL could bring Internet and high-speed broadband access to rural and underserved areas, which often are difficult to serve due to the high costs associated with upgrading existing infrastructure and interconnecting communication nodes with new technologies.

2. Through this inquiry, we seek information and technical data so that we may evaluate the current state of BPL technology and determine whether changes to Part 15 of the Commission's rules are necessary to facilitate the deployment of this technology. While BPL may be deployed under our existing Part 15 rules, the rules do not specifically provide measurement procedures that apply to systems using the power line as a transmission medium. We therefore seek comment on what changes, if any, we should make to our Part 15 rules to promote and encourage the new BPL technology and to our measurement procedures for all types of carrier current systems. We further encourage present deployment of BPL that complies with our existing rules, noting that if, or when, our rules are modified, those rules will address prospective compliance.

II. BACKGROUND

3. As indicated above, BPL systems are new types of carrier current system that operate on an unlicensed basis under Part 15 of the Commission's rules. BPL systems use existing electrical power lines as a transmission medium to provide high-speed communications capabilities by coupling RF energy onto the power line. BPL systems may operate either inside a building ("In-House BPL") or over utility poles and medium voltage electric power lines ("Access BPL"). As In-House BPL systems can use the electrical outlets available in every room of a building to transfer information between computers and between other home electronic devices, they eliminate the need to install new wires between these devices. Using this technology, consumers can readily implement communications local area networking and similar technology.¹ Access BPL systems can be used to provide high speed internet access and other broadband services to homes as well as providing electric utility companies with a means to more effectively manage their electric power distribution operations. Given that Access BPL can be made available in conjunction with the delivery of electric power, it may provide an effective means for "last-mile" delivery of broadband services and may offer a competitive alternative to digital subscriber line (DSL), cable modem services and other high-speed Internet technologies.

4. The idea of using the alternating current (AC) power lines to carry information to a variety of devices is not new. A number of devices or systems already use carrier current techniques to couple radio frequency (RF) energy to the AC electrical wiring for purposes of communication. For example, AM radio systems on some school campuses employ carrier current technology;² many devices intended for the home, such as intercom systems and remote controls for electrical appliances and lamps also utilize carrier current technology;³ and for many years, electric utilities have been using carrier current technology to monitor and control the electrical power grid. More recently, these systems have been used to convey information in digital form, providing communications at relatively slow transmission speeds on carrier frequencies below 2 MHz. All such devices are subject to our existing Part 15 rules for low-power, unlicensed equipment operating on a non-interference basis.⁴

5. The Part 15 rules limit the amount of conducted RF energy that may be injected into a building's wiring by an RF device that receives power from the commercial power source, including carrier current systems that couple RF energy onto the AC wiring for communication purposes. This conducted energy can cause harmful interference to radio communications via two possible paths. First, the RF energy may be carried through the electrical wiring to other devices also connected to the electrical wiring. Second, at frequencies below 30 MHz, where wavelengths exceed 10 meters, long stretches of electrical wiring can

¹ Home networks allow information to be transferred among computers, set-top boxes, information appliances and consumer electronics devices. Applications of home networking include shared Internet access, shared printing, file sharing between personal computers, and device control.

² Campus radio systems have been operating for over fifty years in the United States at many universities as unlicensed broadcast radio stations in the AM Broadcast band. Initially, the receiver and signal source were attached to the same electric power line. With the advent of the transistor radio, the receiver is still able to pick-up enough signal for adequate reception when placed next to the electric power line in a dormitory or other locations on the electric power lines. See 47 C.F.R. § 15.221.

³ See e.g., X-10 products for home automation at <<http://www.X10.com>>, and products conforming to ANSI/EIA-600.31-97 *Power Line Physical Layer and Medium Specification* (CEBus Standard).

⁴ See 47 C.F.R. §§ 15.3(f) & (t), 15.5, 15.31(d), (f), (g) & (h), 15.33(b)(2), 15.107(a)-(c), 15.109(a), (b), (e) & (g), 15.113, 15.201(a), 15.207(c), 15.209(a) and 15.221.

act as an antenna, permitting the RF energy to be radiated over the airwaves. Due to the low propagation loss at these frequencies, such radiated energy can cause interference to other services at considerable distances.

6. The existing Part 15 rules cover two types of power line equipment, carrier current systems and power line carrier systems. A carrier current system is defined as a system, or part of a system, that transmits radio frequency energy by conduction over the electric power line to a receiver also connected to the same power line.⁵ A carrier current system can be designed such that the signals are received by conduction directly from connection to the electric power line (unintentional radiator), or the signals are received over-the-air, due to radiation of the radio frequency signals from the power line (intentional radiator).⁶ Power line carrier systems, which operate between 10 kHz and 490 kHz, are carrier current systems used by an electric public utility entity for protective relaying, telemetry, etc., for general supervision of the power system.⁷ Power line carrier systems are not subject to specific emission limits as are carrier current systems.⁸

7. As indicated above, until recently, carrier current devices have operated generally on frequencies below 2 MHz with limited communications capabilities over the electric power wiring. The power line is a noisy communications medium, characterized by several unpredictable and strong forms of interference generated by devices such as dimmer switches, motorized electrical appliances and computers. The power line potential communication channels between different outlets are further characterized by fast fading, non-flat frequency responses and changing impedances. Because of these inherent non-linear characteristics, reliable high-speed communications over power lines have been difficult to achieve. However, the availability of faster chip sets and the development of sophisticated modulation schemes have produced new designs that can overcome these earlier technical obstacles, *e.g.*, extreme vulnerability to power line noise, which causes drop-off in transmission speeds and disruptions due to random home power usage of other appliances. New BPL devices operate on multiple carriers that are spread over a wide spectrum (*e.g.*, from 4.5 MHz to 21 MHz), with adaptive algorithms to counter the noise in the line. Data transmission speeds rated at 14 Mbps and higher have been claimed for in-house communications.⁹ BPL devices intended to carry high-speed broadband services to neighborhoods over a utility's power lines have claimed speeds comparable to DSL and cable in actual BPL experimental installations.¹⁰ This

⁵ See 47 C.F.R. § 15.3(f).

⁶ See 47 C.F.R. §§ 15.3(z) and 15.3(o), respectively.

⁷ See 47 C.F.R. § 15.3(t). A carrier current system operated by an electric utility to control the utility's electrical grid is defined as a power line carrier system in the rules.

⁸ Power line carrier systems are only subject to 47 C.F.R. § 15.113.

⁹ For example, the HomePlug Alliance, a consortium of over 90 companies, has published its HomePlug 1.0 standard for PLB systems operating inside the home, with rated data speeds up to 14 Mbps and with multiple carrier frequencies spread between 4.5 and 21 MHz. Various independent tests performed by interested groups (*see e.g.*, <<http://www.pcworld.com/features/article/1,aid,86935,pg,7,00.asp>>) demonstrated sustained data throughput for HomePlug devices in the range of 5 to 6 Mbps.

¹⁰ The Commission has recently granted experimental licenses to certain companies under 47 C.F.R. § 5, to evaluate outdoor PLB equipment installed on overhead power lines that operate over the range 1.7 to 80 MHz. A list of the experimental grants may be found at https://gulfoss2.fcc.gov/prod/oet/index_els_ie.html.

new generation of high-speed BPL devices that use wide spectrum was not contemplated under the existing Part 15 rules when they were formulated.

8. In addition, the existing Part 15 rules do not provide a clear procedure for measuring emissions from carrier current systems. On May 29, 1998, the Commission adopted a *Notice of Inquiry* in ET Docket No. 98-80 to examine its Part 15 line conducted emission limits.¹¹ As part of that proceeding, the Commission requested comments on its existing Part 15 carrier current requirements and measurement issues. The *Report and Order* in that proceeding harmonized the Part 15 requirements for conducted emission limits with the international standards developed by the International Electrotechnical Commission (IEC), International Special Committee on Radio Interference (CISPR).¹² However, because of the ongoing development of systems using new BPL technology, the Commission also decided in that *Report and Order* to defer the consideration of carrier current systems and BPL system issues to a separate proceeding.¹³

III. DISCUSSION

9. The Commission has observed with great interest and anticipation developments in the area of high-speed communications over the power line. High speed transmission capabilities could enable BPL technology to provide an alternative platform for broadband deployment, which would bring valuable new services to consumers, stimulate economic activity, improve national productivity and advance economic opportunity for the American public, consistent with the Commission's objectives. BPL technology could play an important role in enabling Internet and high-speed broadband access to rural areas, because power lines reach virtually every home in the United States. BPL technology could also be used to assist the utilities by adding intelligent networking capabilities to the electric grid, thereby improving efficiency in activities such as energy management, power outage notification and automated meter reading. Furthermore, the electrical wiring in homes and office buildings establishes a physical connection between all electrical devices and power outlets that are located every few feet in most American homes. The high number of access points¹⁴ can be used to provide networking applications within a building, eliminating the need for new or additional wiring to connect networking adaptors, thus allowing consumers to readily take advantage of the technology. In addition, homeland security would be enhanced by creating new facilities to provide redundancy in case of disruption of one or more existing channels of communications.

10. The Commission has a long history of facilitating the introduction of new technologies under Part 15 of its rules. For example, in the mid-1980's, the Commission provided new rules to spread spectrum technology that led to the growth of an industry and a wide array of products. In the past few years, the Commission has amended Part 15 to provide for unlicensed personal communication service (UPCS) devices, unlicensed national information infrastructure (UNII) devices and millimeter wave technology.

¹¹ See 1998 Biennial Regulatory Review - Conducted Emission Limits Below 30 MHz for Equipment Regulated under Parts 15 and 18 of the Commission's Rules, ET Docket 98-80, *Notice of Inquiry*, 13 FCC Rcd 12955 (1998).

¹² See 1998 Biennial Regulatory Review - Conducted Emission Limits Below 30 MHz for Equipment Regulated under Parts 15 and 18 of the Commission's Rules, ET Docket 98-80, *Report and Order*, rel. May 30, 2002.

¹³ *Id.*, at ¶ 2.

¹⁴ In the United States, the average home has fewer than 5 telephone jacks and cable TV connections but may have 10 times as many AC outlets.

We are initiating this inquiry to determine what, if any, changes to our rules may be appropriate to facilitate the development and deployment of BPL and what standards and operating requirements are necessary to prevent interference to other users of the spectrum. Accordingly, we seek information on the topics as discussed below, to help us determine whether to propose any changes to our Part 15 rules to promote BPL technology.

11. At the present time, the primary means for controlling interference from carrier current systems operating from 9 kHz to 30 MHz is a limit on the radiated emissions from any part of the wiring or power network connected to the RF power source.¹⁵ The radiated emission limits, which vary with frequency, apply from 9 kHz to an upper frequency that is dependent on the highest fundamental frequency of the device under test.¹⁶ For carrier current systems that contain their fundamental emission within the standard AM broadcast band of 535 to 1705 kHz and are intended to be received using standard AM broadcast receivers, there is no limit on conducted emissions.¹⁷ All other carrier current systems operating below 30 MHz are subject to a conducted emission limit only within the AM broadcast band.¹⁸ Until recently, carrier current systems have not operated above 30 MHz. However, Part 15 digital devices, including carrier current systems, operating as general intentional and unintentional radiators above 30 MHz are subject to both radiated emission limits and conducted emission limits. The limits apply from 30 MHz to an upper frequency that is dependent on the highest fundamental frequency of the device under test.¹⁹ Depending on the operating environment of the digital device, either Class A or Class B radiated emission limits are specified.²⁰ Digital devices operating above 30 MHz are also subject to either Class A or Class B conducted emission limits, depending on their operating environment, if they receive power from the power line.²¹

¹⁵ See 47 C.F.R. § 15.109(e). Radiated emission limits vary with frequencies; for example, in the 1705 kHz to 30 MHz region, the radiated emission limit is 30 µV/meter, at a measurement distance of 30 meters.

¹⁶ See 47 C.F.R. §§ 15.109(e), 15.209(a) & 15.33(b)(2). For example, if the highest frequency generated or used in the device, or on which the device operates or tunes is 10 MHz, the upper frequency to be examined is 500 MHz.

¹⁷ A conducted limit was not considered practical when the rules were formulated for campus radio systems, since these systems intentionally couple RF energy onto the power line. See 47 C.F.R. § 15.107(c). Carrier current systems whose fundamental emission is intended for reception on AM broadcast receivers avoid interference to AM radio service by operating on a frequency that is not used by a local AM station.

¹⁸ For the protection of the AM Broadcast service, the device is subject to a conducted emission limit of 1000 µV in the AM broadcast band (from 535 to 1705 kHz). See 47 C.F.R. §§ 15.107(c)(2) and 15.221. This provision does not apply to power line carrier systems, which are subject to 47 C.F.R. § 15.113.

¹⁹ See 47 C.F.R. §§ 15.33(b)(1). For example, if the highest frequency generated or used in the device, or on which the device operates or tunes is 50 MHz, the upper frequency to be examined is 1000 MHz.

²⁰ See 47 C.F.R. §§ 15.109(a), (b), (e) & (g). Radiated limits for digital devices are separated into limits for Class A devices (See 47 C.F.R. §§ 15.109(b)) and for Class B devices (See 47 C.F.R. §§ 15.109(a)). Class A equipment is marketed for use in a commercial, industrial or business environment, excluding devices which are marketed for use by the general public or are intended to be used in the home. See 47 C.F.R. § 15.3(h). Class B equipment is marketed for use in a residential environment, notwithstanding use in commercial, business and industrial environments. See 47 C.F.R. § 15.3(i).

²¹ See 47 C.F.R. § 15.107(a) & (b) and footnote 18, *supra*. Conducted limits are also separated into limits for Class A devices (See 47 C.F.R. §§ 15.107(b)) and for Class B devices (See 47 C.F.R. §§ 15.107(a)). Conducted limits are (continued....)

12. We now believe that the introduction of new high-speed BPL technologies warrants a systematic review of the Part 15 rules in order to facilitate the deployment of this new technology, promote consistency in the rules and ensure the ongoing protection of the licensed radio services. To this end, we first seek to examine the new BPL technology and its various operating environments.

13. In BPL technology, communication is accomplished by overlaying digital equipment at certain points along the electric power distribution network. In Access BPL systems, three components of the electric power distribution network are directly involved. The first is the medium voltage line, carrying typically 1000 to 40,000 volts, over which an electric utility brings power from a substation to a residential neighborhood. The second component is the bypass of the low-voltage transformer in the residential neighborhood that steps down the line voltage to the 220/110 volts for residential use.²² The third component of the existing power distribution system is the low voltage distribution from the transformer to residential electrical outlets, including the exterior service cable, circuit breaker panel, and interior wiring. In-House BPL systems use just the low-voltage wiring to provide local communications among devices attached to the electrical outlets in the home. The communication from an In-House BPL system to a telecommunications network (*e.g.*, to provide Internet access) could be made available through one of a number of access technologies including dial-up, DSL, cable modem service, or Access BPL. Due to their different operating environments and probable interference patterns, we will examine Access BPL and In-House BPL separately, *infra*. We recognize that BPL technology is at an early stage of development and its provisioning methods are evolving, and we seek comment on whether there are other architectural models and/or functional components that must be identified in order to adequately address all the issues raised by this technology.

14. Access BPL Systems. Access BPL systems carry high-speed data and voice signals outdoors over the medium voltage line from a point where there is a connection to a telecommunications network. This point of connection may be at a power substation or at an intermediate point between substations, depending on the network topology. Near the distribution point to a residential neighborhood, a coupler or bridge circuit module is installed to enable the transfer of high-frequency digital signals across the low-voltage distribution transformer.²³ Finally, the high-speed communication signals are brought to the home over the exterior service power cable from the bridge across the distribution transformer, either directly, or via an Access BPL adaptor module.

15. Several consortiums have been organized to promote Access BPL and its applications; however, the operating characteristics of Access BPL are not standardized.²⁴ In order to assist us in understanding the current state of Access BPL, we seek comment and information in response to the following questions:

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generally specified from 150 kHz to 30 MHz only, because signals below 30 MHz have wavelengths greater than 10 meters and lower propagation losses, and can take special advantage of long stretches of electrical wiring.

²² There are limits on the effective operating length of the service cable between the transformer and a residence, such that in the United States, a single low-voltage transformer serves on average six to eight residential units. A single transformer may serve more residences in urban and multi-dwelling settings and fewer in rural settings.

²³ The low voltage transformer is a poor conduit for high-frequency digital signals, as it is intended to conduct 60 Hz signals.

²⁴ Access PLB consortiums include the Power Line Communications Association, the United Power Line Council, the European PLCForum Association, and others.

- What spectrum and bandwidth would Access BPL use? We have granted experimental licenses to some parties under 47 C.F.R. § 5 to evaluate Access BPL equipment that operates from 1.7 to 80 MHz. Would Access BPL devices operate in other portions of the spectrum and at what bandwidth?²⁵
- Is the spectrum used by Access BPL shared with In-house BPL? Are there any frequency sharing issues to be considered, *i.e.*, should we designate spectrum for Access BPL and In-House BPL? Is spectrum sharing between Access BPL and In-House BPL feasible?
- What data transmission speeds can Access BPL systems achieve? What speeds can be typically sustained under normal user environment conditions? What speeds are envisioned with deployed access shared among several users? Are the speeds symmetric in both the transmit and receive directions?
- What are the modulation techniques? What techniques are used for ensuring the security of data? What schemes are used for contention resolution between Access and various In-House BPL devices, if more than one device needs to take control of the electric wire at the same time to communicate?
- Would Access products work with In-House BPL products and services, without the need for additional equipment, such as converters and adaptors?
- What is the status of development and anticipated timeline for market deployment of Access BPL equipment?
- What standards work has been done domestically and internationally on Access BPL and what are the results of such activities? Are there ongoing international standards activities that would benefit U.S. industry and what steps should the Commission take to encourage this work? We are aware that the IEC CISPR Subcommittee I on *Interference Relating To Multimedia Equipment*, Working Group 3 on *Emission from Information Technology Equipment*, is developing conducted emission limits for new BPL technologies. Are there other standards bodies involved in similar activities?

16. In-House BPL Systems. A number of high-speed In-House BPL devices have reached the market within the last few months, operating under our existing Part 15 rules for carrier current systems. In-House BPL systems carry data and voice signals between the wiring and electrical outlets inside of a building. In-House BPL systems are aimed at home networking and sharing of resources between devices, such as multiple computers, printers and smart appliances. Each device to be networked is connected to a BPL adaptor module through a Universal Serial Bus (USB) or Ethernet port. The BPL adaptor module plugs into a power outlet and communicates over the electrical wiring with other similar BPL adaptor modules in the home, thus forming a peer-to-peer local area network between these devices. In-House BPL operation may provide Internet sharing or other external service connections independently of Access BPL service. For example, an in-house local area network could interface with an Internet connection that may be provided from a variety of sources, such as cable, DSL, or dial-up analog line, not necessarily just from an Access BPL service. In other words, the operation and external networking functions of In-House BPL do not depend on the consumer having Access BPL communication service at the same time.

²⁵ Some Access PLB equipment deployed in Europe operates from 1.7 MHz to 10 MHz.

17. There are several operational standards for In-House power line applications.²⁶ The HomePlug Alliance released its HomePlug 1.0 standard based on Intellon and Cogency chip sets in 2001. The Consumer Electronics Association (CEA) has a working group on power line standards. There are also other individual companies designing and marketing their own PLC chip sets for sale to PLC device vendors.²⁷ In addition, there are several consortiums organized to promote In-House BPL technology and its applications.²⁸ In-House BPL networking capabilities would encourage the growth of smart appliances and other consumer electronics equipment, facilitating the sharing of resources between various devices and increasing productivity. In order to assist us in understanding the high speed In-House BPL technology, we seek comment in the following areas:

- In-House BPL systems built to the HomePlug standard specifications operate in the frequency range from 4.5 to 21 MHz. Are other In-House BPL devices being designed to operate in other portions of the spectrum, and at what bandwidth?²⁹
- What is the highest data transmission speed that In-House BPL systems can achieve? What speeds can be typically sustained under normal user environment conditions?
- What are the modulation techniques? What techniques are used for ensuring the security of data, especially when several residential units share the same common distribution transformer? What schemes are used for contention resolution between various In-House BPL devices, if more than one device needs to take control of the electric wire at the same time to communicate?
- Would products developed according to one standard work with products developed according to another standard, without the need for additional equipment, such as converters and adaptors?
- What standards work has been done domestically and internationally on In-House BPL technology and what are the results of such activities? Are there on-going international standards activities that would benefit U.S. industry and what steps should the Commission take to encourage this work?³⁰

18. Interference from BPL Emissions. In both Access and In-House high-speed BPL technologies, multiple carriers spread signals over a broad range of frequencies that are used by other services that must be protected from interference. In the spectrum below 30 MHz, incumbent authorized operations include fixed, land mobile, aeronautical mobile, maritime mobile, radiolocation, broadcast radio, amateur radio terrestrial and satellite, and radioastronomy. In the spectrum from 30 to 300 MHz, incumbent authorized

²⁶ See e.g., ANSI TIA/EIA 600.31 *Power Line Physical Layer and Medium Specifications*, and ANSI TIA/EIA 709.2 *Control Network Power Line (PL) Channel Specification*.

²⁷ See nSine, <http://www.nsine.com/>; EasyPlug, <http://www.easyplug.com/>; Itran, <http://www.itrancomm.com/>; Enikia, <http://www.enikia.com/>; DS2, <http://cgi.ds2.es/>; Phonex Broadband Corporation, <http://www.phonex.com>.

²⁸ In-House PLB consortiums include the Consumer Electronics Association, the EchoNet Consortium, the HomePlug Alliance, the European PLCForum Association, etc.

²⁹ Some In-House PLB equipment deployed in Europe use spectrum from 10 to 30 MHz.

³⁰ See ¶ 12, *supra*.

operations include fixed land mobile, aeronautical mobile, maritime mobile and mobile satellite, radioastronomy, amateur radio terrestrial and satellite, broadcasts TV and radio. This spectrum is also used for public safety and law enforcement, and Federal government aeronautical radionavigation, radionavigation satellite and radiolocation. Each of these authorized services in the spectrum must be protected from harmful interference.

19. Interference issues may also arise because existing statutes on pole attachment require the co-location of cable and telecommunications equipment from third party service providers on the same utility poles that carry power wires.³¹ The close proximity of Access BPL equipment on utility poles may affect (and be affected by) the operation of cable television service and high-speed digital transmission service, such as DSL.

20. We therefore ask for comment and information on the following questions:

- In order to transfer high frequency signals beyond the low-voltage distribution transformer, Access BPL systems use high-pass filter circuits to bypass the transformer and its inherent low-bandwidth characteristics. What is the effect of these high-pass filters with respect to high-frequency signals used inside the house, *e.g.*, from In-House BPL equipment or other in-premises technologies, that may rely on the low-voltage transformer as a natural barrier to avoid causing interference at higher frequencies?
- For Access BPL systems, several methods of RF signal injection onto the medium voltage lines can be envisioned:
 - An RF voltage could be applied between a power line and ground;
 - An RF voltage could be applied differentially between two phases of a power line; or
 - A single power line wire could be driven as if it were a dipole antenna—*e.g.*, by inductively coupling RF energy to it.

Other approaches may also be possible. What methods are being considered for signal injection onto the medium voltage lines? What are the implications on radiated emissions of various methods for injecting signals onto the medium voltage lines (*e.g.*, differences in directional characteristics and magnitudes of the emitted fields)?

- Is there a need to define frequency bands that must be avoided in order to protect the licensed users on the same frequencies as those used by Access BPL systems? Are there mitigation techniques Access BPL systems can use to avoid possible interference with licensed users of the spectrum, such as mobile users or public safety and law enforcement users who may be traveling directly beneath the medium voltage lines?

³¹ The Pole Attachment Act of 1978 gave the Commission authority to regulate the rates, terms and conditions for attachment of distribution cables from cable television companies to utility poles, in any state that does not have such regulations in place. The 1996 Telecommunications Act (the Act) added a nondiscriminatory access provision to the Pole Attachment Act, requiring any utility that uses its poles, ducts, conduits or rights of way for wire communications to provide cable television or telecommunications companies with access to that space in a non-discriminatory basis. See 47 U.S.C. § 224(b)(1). Access PLB equipment could therefore be installed in close proximity of cable television equipment and telecommunications equipment carrying high-speed digital transmission signals.

- Since Access BPL equipment is installed on medium voltage lines that supply electricity to a residential neighborhood, should this equipment be treated as operating in a residential (Class B) or commercial (Class A) environment?³²
- How does the close proximity of Access BPL equipment to cable television and telecommunications equipment from third party service providers co-located on the same utility pole affect the operation of these services? On the other hand, what is the effect of this close proximity to Access BPL operations?
- High-speed In-House BPL systems are being deployed in residences with a telecommunications access connection from a DSL or cable modem service. What mitigation techniques are used by In-House BPL systems to avoid possible interference from DSL or cable modem within the same spectrum? On the other hand, what is the effect of DSL or cable modem on In-House BPL operations?
- What mitigation techniques are used by In-House BPL systems to avoid possible interference with licensed radio services, such as amateur radio, fixed, mobile and broadcast services? Is there a need to define frequency bands that must be avoided in order to protect the licensed services that use the same frequencies as In-House BPL systems?
- What are the probable interference environments and propagation patterns of Access BPL and In-House BPL systems? Are there specific issues of interference that we should address, *e.g.* an increase in the level of the noise floor? What models are available for predicting radiated emissions from access BPL systems?
- Are there test results from field trials of Access BPL that may assist in the analysis of harmful interference? Inasmuch as In-House BPL equipment is already on the market, are there any reports that may assist in the further analysis of harmful interference?³³
- Are the existing Part 15 rules for low speed carrier current systems adequate to protect authorized users of the spectrum who may be affected by the new high speed BPL technology? What changes to these rules, if any, are necessary to protect authorized radio services?
- How should the Part 15 rules be tailored both to ensure protection against harmful interference to radio services and to avoid adversely impacting the development and deployment of this nascent technology?
- Given their different operating environment, is it necessary to tailor the rules to differentiate equipment used specifically in Access BPL and In-House BPL applications, or should one set of general limits be applied to both? What should such limits be and what is the technical basis for them?
- Is there need to specify different limits for Access and In-House systems? For example, would it be appropriate to allow higher emissions for In-House systems where the user would be the principal party affected by interference, and could take steps to mitigate the interference, than for Access systems where the interference would affect a wider area and therefore be more

³² See ¶ 8, *supra*.

³³ See footnote 9, *supra*. The FCC Laboratory is also in the process of testing In-House and Access PLB products.

problematic to mitigate? Would higher emissions for In-House systems result in any interference effects in other houses or apartments sharing the same local low voltage distribution by the RF signal being distributed on the low voltage side of the transformer? What limits should be specified, given the above considerations?

- Should the Part 15 rules specify both radiated emission limits and conducted emission limits for BPL systems, or would one type of limits be sufficient to control interference from both low speed and high speed BPL? Since all carrier current systems inject RF signals into the power line for communication purposes, would conducted emission limits be more appropriate to protect authorized radio services?

21. Measurement methods. We seek comment on measurement methods for all types of carrier current systems, including new high-speed Access and In-House BPL devices. Because existing carrier current systems use the power line wiring inside a building to transfer information and data, the radiated emissions from RF energy conducted onto the power lines tend to vary from location to location, based on the installation's AC wiring and the loading placed on that wiring. In effect, since the installation's wiring functions as an antenna, that wiring becomes part of the system to be evaluated. As such, measurements to demonstrate compliance with the rules are not normally made at a standard open area test site, because the measurement of each system is unique to its location.

22. Rather than requiring compliance measurements for each individual carrier current system installation, we have allowed measurements of radiated emissions at three installations that the operator deems as representative of typical installations.³⁴ For carrier current systems operating below 30 MHz, the radiated limits specify measurement distances ranging from 30 to 300 meters.³⁵ The radiated limits for unintentional radiators operating above 30 MHz specify a measurement distance of 10 meters for Class A devices and 3 meters for devices other than Class A. Since measurements at large distances are not always practical, the rules provide for measurements at distances other than those specified, with the use of extrapolation factors. The actual extrapolation factor can be determined empirically. Alternatively, an extrapolation factor of 40 dB per decade can be used for frequencies below 30 MHz and an extrapolation factor of 20 dB per decade can be used when testing frequencies at or above 30 MHz.³⁶ For measurements below 30 MHz, a loop antenna is required to be used to measure the emissions from the device.

23. Radiated emission measurements of carrier current equipment at frequencies below 30 MHz can be time consuming and difficult to make because each installation's wiring is unique. The variations in wiring across different installations pose problems for achieving repeatability of results and for finding installations that can be considered representative. Currently, there are no specific test methods in our

³⁴ See 47 C.F.R. § 15.31(d). There is no test procedure specified in the rules for carrier current systems; however, general guidance on emission measurements below 30 MHz may be found in the American National Standards Institute (ANSI) C63.4 *Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*.

³⁵ See 47 C.F.R. §§ 15.109 and 15.209.

³⁶ See 47 C.F.R. § 15.31(f)(1) & (2). The extrapolation factor is used to address the difficulty of making measurements at large distances. "Decade", a 10:1 range, refers to the ratio of the specified measurement distance to the actual measurement distance. For example, in the 1.705-30 MHz band, measurements are specified at a distance of 30 meters. If however, actual measurements were made at a distance of 3 meters, the ratio of the distances is a decade (30/3=10) and the field strength result must be corrected by subtracting 40 dB.

rules for carrier current systems, rather, measurement procedures have been left to the discretion of the party performing the tests, and thus measurements can be subjective and inconsistent. Furthermore, Access BPL equipment presents unique measurement challenges because it is typically installed on utility poles and operated over medium voltage lines. We therefore request comment and input on the following questions:

- How should the measurement procedures for testing existing low-speed carrier current systems be developed in order to avoid the burden of selecting representative installations and to promote consistency and repeatability of test results? Is it possible to develop a standardized measurement method for testing in a laboratory or at an open area test site using some characterized wiring assembly or artificial impedance network? If so, how?
- How should measurement procedures for testing new BPL systems, both Access and In-House, be developed in order to promote consistency with measurements of existing carrier current systems and repeatability of test results?
- Conducted emissions testing is usually performed using a line impedance stabilization network (LISN), which is an artificial power line network that provides a specified load impedance in a given frequency range. This device is also used to isolate the equipment from the AC supply and to facilitate measurements. If conducted emission limits alone are sufficient to control harmful interference from BPL systems, how should the measurement procedure be specified? How should the characteristics of a line impedance stabilization network be specified for testing both In-House and Access BPL systems?
- Existing literature is inconclusive on the degree of difference in radiated emissions from houses and buildings when In-House PLC signals are injected in common mode (phase/neutral to an RF ground) versus differential mode (phase to neutral). Is there data available that shows radiated emission levels from houses and other buildings, located in the United States, for both types of signal injection? Is the difference sufficiently large as to justify separate conducted limits for common mode and differential mode signals? Alternatively, should a LISN be defined to simultaneously measure the total effect of the common-mode and differential-mode contributions in proportion to their expected respective contributions to radiated emissions? What should be the characteristics of that LISN?
- How should In-House BPL systems be tested for compliance, given that they use the building's wiring as an antenna? The impedance characteristics of in-house wiring changes each time an appliance is turned on or off, which makes modeling this varying impedance a challenging task. Is it possible to develop a standardized measurement method for testing In-House BPL in a laboratory or at an open area test site using a specialized LISN or some characterized wiring assembly? If so, how? Would the same method of measurement be sufficient to test both traditional carrier current system and new high speed In-House BPL?
- How should Access BPL systems be tested for compliance, given that they generally operate in an environment where signals travel on overhead medium voltage lines? Could a standardized measurement method be developed for testing Access BPL in a laboratory or at an open area test site, using a specialized LISN or some characterized pole and wiring assembly? If so, how?
- Are there any international standards that should be investigated for possible adoption in order

to facilitate the development of BPL products for a global marketplace?³⁷

24. Equipment Authorization Process. Section 302 of the Communications Act of 1934, as amended, authorizes the Commission to make reasonable regulations, consistent with the public interest, governing the interference potential of equipment that emits radio frequency energy.³⁸ The Commission carries out its responsibilities under this section by establishing technical regulations for transmitters and other equipment to minimize their potential for causing interference to radio services, and by administering an authorization program to ensure that equipment reaching the market complies with the technical requirements. The authorization program requires that equipment be tested either by the manufacturer or at an independent test laboratory to ensure that it complies with the technical requirements. The authorization program specifies several procedures for demonstrating equipment compliance. The procedure to which a device is subject depends on the risk of interference that the equipment poses to licensed radio services.

25. *Certification* is an equipment authorization issued by the Commission or its designated entities,³⁹ based on representations and test data submitted by the applicant.⁴⁰ A *Declaration of Conformity* (DoC) is a manufacturer's self-approval procedure where the responsible party, who could be the manufacturer, the grantee or the importer of the equipment, as defined in 47 C.F.R. § 2.909, makes measurements or takes other necessary steps to ensure that the equipment complies with the appropriate technical standards.⁴¹ The laboratory performing the measurements, either the manufacturer's laboratory or an independent test laboratory, must be accredited.⁴² A copy of the declaration of conformity, listing the party responsible for compliance, must be included in the literature supplied with the product. *Verification* is also a manufacturer's self-approval procedure where the manufacturer makes measurements or takes the necessary steps to ensure that the equipment complies with the appropriate technical standards,⁴³ however, unlike the DoC procedure, it does not require the use of an accredited laboratory and does not require a declaration of conformity to be supplied with the equipment.

26. Currently, equipment operating as carrier current systems, such as power line intercom systems, lamp remote controls, low speed power line telephone adaptors, etc. are subject to the *Verification* procedure under our equipment authorization program. As indicated, *supra*, the low speed systems have not been a source of harmful interference to radio communications. In addition, it appears that use of the *Verification* procedure has been adequate to ensure that such systems comply with the rules. However, the multiple-carrier transmission nature of the new high speed BPL technology could pose increased risk

³⁷ See ¶ 12, *supra*.

³⁸ See 47 U.S.C. § 302(a).

³⁹ The Commission recently made changes to Part 2 of the rules to allow designated private organizations, called Telecommunication Certification Bodies (TCBs), to approve equipment in the same manner as the Commission. See *Report and Order* in GEN Docket 98-68, 13 FCC Rcd 24687 (1999).

⁴⁰ See 47 C.F.R. § 2.907.

⁴¹ See 47 C.F.R. § 2.906.

⁴² See 47 C.F.R. § 2.948(d). The laboratory must be accredited by the American Association for Laboratory Accreditation (A2LA), the National Voluntary Laboratory Accreditation Program (NVLAP) or a Designating Authority of a trading partner having a Mutual Recognition Agreement/Arrangement (MRA) with the United States

⁴³ See 47 C.F.R. § 2.902.

of harmful interference, and thus new BPL devices may need a higher degree of oversight to ensure that authorized users are not subject to interference. Accordingly, we seek comment on the following questions:

- Would the new high speed Access and In-House BPL equipment pose a higher risk of interference to licensed radio services than the traditional carrier current systems?
- Unlike In-House BPL equipment, which usually involves multiple units of a standard module working together,⁴⁴ Access BPL may involve two or more different types of components to form the complete system (e.g., Access BPL medium voltage coupler, Access BPL adaptor module, etc.)⁴⁵ What components of an Access BPL system should be subject to equipment authorization?
- Should the new Access and In-House BPL equipment be required to comply with either the *Certification* procedure or the *Declaration of Conformity* under our equipment authorization program, which warrants additional oversight, or should they be covered under our *Verification* procedure like the traditional carrier current systems?

27. Power Line Carrier Systems. The existing Part 15 rules also address power line carrier systems. The existing low speed, low frequency power line carrier systems are not subject to our equipment authorization program, or to the emission rules applicable to carrier current systems; however, these systems must operate on a non-interference basis as restricted low power transmitters covered under Part 15.⁴⁶ Furthermore, information on these systems must be entered into a database coordinated by the United Telecom Council (formerly Utilities Telecommunications Council) (UTC), the designated coordinator and database operator for power line carrier systems, pursuant to a 1991 Memorandum of Understanding (MOU) between the Federal Communications Commission, the National Telecommunications and Information Administration (NTIA) and the UTC.⁴⁷

28. We believe that the new high speed BPL technology could be used to assist the utilities by adding intelligent networking capabilities to the electric grid, allowing various interconnected and network-addressable BPL components to work together in improving efficiency in activities such as energy management, power outage notification and automated meter reading. In order to help us in evaluating the applicability of BPL technology to power line carrier systems, we seek input on the following questions:

⁴⁴ See description of In-House PLB systems in ¶ 13. Although each computer to be networked must be connected to an In-House PLB module, all In-House PLB modules are similar in functionalities; in most cases, identical In-House modules are used to interconnect. Each module must be authorized through the Equipment authorization program; however, one equipment authorization number covers all identical models.

⁴⁵ On the other hand, an Access PLB system may be composed of multiple, different but essential components that must work together in order for the system to be functional. Equipment authorization of a system composed of multiple components usually requires all components to be included in the authorization.

⁴⁶ See 47 C.F.R. § 15.5.

⁴⁷ See 47 C.F.R. §§ 15.113 and 90.35(f). See also *Memorandum Of Understanding of the Purpose, Requirements, and Procedures for a Power Line Carrier Notification Activity between the Federal Communications Commission, National Telecommunications and Information Administration, and Utilities Telecommunications Council*, Reference IRAC DOC. 26177, approved December 13, 1988, revised May 1, 1991.

- Will the power line carrier systems currently deployed by the utility companies to control and monitor the electrical system be replaced in the future with the new high speed BPL equipment?
- How would the utility companies deploy these new control systems and how would these new systems coexist with the older control systems?
- Should power line carrier systems using BPL technology be subject to the coordination process in the current database maintained by UTC?
- Are any changes needed in the regulations governing power line carrier systems? Should power line carrier systems using BPL technology be subject to the general requirements for Access BPL systems, since the same system may now be carrying broadband signals as well as monitoring and control signals? How could, or should, these functions be separated?
- What interference issues, if any, besides the issues raised under the general BPL interference section, *supra*, must be addressed with the deployment of high-speed power line carrier systems?

29. Other Matters. The questions raised in this Notice of Inquiry are intended to solicit information to assist the Commission in deciding whether to propose rule changes as a result of the developing BPL technology. We realize that these questions do not necessarily encompass all of the possible issues raised by this technology. Parties therefore may wish to comment on the following additional topics:

- What standardized transport and data link protocols are typically used between a user's personal computer, for example, and the Internet point of presence, over Access BPL systems? For example, is Point-to-Point Protocol (PPP), PPP over Ethernet (PPPoE), Asynchronous Transfer Mode (ATM), or other such lower layer protocols involved?

30. We seek information on the subject of communications over electric power lines from all interested parties to obtain a wide representation of viewpoints. Accordingly, we request comments on any other matters or issues, in addition to those discussed above, that may be pertinent to BPL technology.

IV. PROCEDURAL MATTERS

31. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on or before **[45 days from date of publication in the Federal Register]**, and reply comments on or before **[75 days from date of publication in the Federal Register]**. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 24121 (1998).

32. Comments filed through the ECFS can be sent as an electronic file via the Internet to <<http://www.fcc.gov/e-file/ecfs.html>>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body

of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

33. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). The Commission's contractor, Vistrionix, Inc., will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, SW, Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

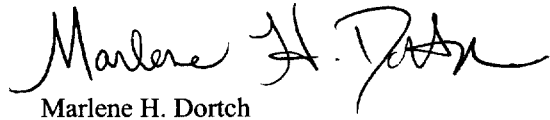
34. **Accessible Formats.** To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0531 (voice), 202-418-7365 (tty).

V. ORDERING CLAUSES

35. IT IS ORDERED, that pursuant to Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 307 and 332(b) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 307 and 332(b), this Notice of Inquiry is hereby ADOPTED.

36. For further information regarding this Notice of Inquiry, contact Anh Wride, Office of Engineering and Technology, (202) 418-0577, awride@fcc.gov.

FEDERAL COMMUNICATIONS COMMISSION



Marlene H. Dortch
Secretary

**SEPARATE STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems,
Notice of Inquiry, ET Docket No. 03-104.*

Broadband over Power Line has the potential to provide consumers with a ubiquitous third broadband pipe to the home. The development of multiple broadband-capable platforms – be it power lines, Wi-Fi, satellite, laser or licensed wireless – will transform the competitive broadband landscape and reap dramatic windfalls for American consumers and the economy. Broadband over power lines is at the cutting edge of this dramatic digital migration that will continue to free applications (e.g., voice, data, and video) from the regulatory and technological shackles that have tied them to specific platforms (e.g., voice to copper and video to coaxial cable). While this migration is well under way, our policies must be dynamic and flexible to further – rather than frustrate – the transition.

Facilitating the development of new facilities-based platforms must be among our core goals. The current wireless industry illustrates the tremendous power of multiple facilities-based providers to foster innovation, promote ubiquity, increase competition and drive down prices. Wireless achieved these successes because the FCC employed a relatively light regulatory hand and licensed multiple providers in each market who built their own facilities to deliver value to consumers. Power lines and other new platforms can deliver the same value in the broadband market.

As I recently witnessed first hand at a local site visit, the potential of this new technology is immense. Broadband over power lines can offer consumers freedom to access broadband services from any room in their home without need to pay for additional wiring, by simply plugging an adaptor into an existing electrical outlet. For our nation's power utilities, Broadband over power lines can improve the utilities' ability to manage their electric grids through applications like remote power outage notification, load management to reduce peak power usage, load balancing, and remote meter reading. Power line technology also provides for useful redundancy and diversity in communications networks that are key aspects of secure homeland communications.

Power line networks are being tested today in a dozen states around the country and are a testament to the incredible innovations taking place in broadband network technologies. Today's notice explores ways to update our rules to ensure that regulatory uncertainty does not in any way hinder the deployment of these new services. Ultimately it will be for the marketplace to decide how broadband over power lines fits into tomorrow's competitive telecommunications landscape, but we welcome them to the frontier of the digital migration.

**SEPARATE STATEMENT OF
COMMISSIONER KATHLEEN Q. ABERNATHY**

***Re: Inquiry Regarding Carrier Current Systems, Including Broadband Over Power Line Systems,
Notice of Inquiry, ET Docket No. 03-104.***

This Notice of Inquiry on power line broadband systems advances the FCC's critical mission of bringing a new broadband platform to the home. This proceeding will enable us to evaluate the current state of powerline technology and determine whether changes to Part 15 are necessary to facilitate its deployment. While the NOI focuses on technical issues, such as procedures for measuring emissions from carrier current systems, its policy implications are unmistakable: If the FCC can help pave the way for the deployment of broadband over power line technologies, that will prove tremendously valuable in promoting the core statutory goals of broadband deployment and facilities-based competition.

As the Commission has repeatedly made clear, facilitating broadband deployment is one of our central policy objectives. In the *Triennial Review* proceeding, the Commission sought to promote this goal by restoring incentives for wireline carriers to invest in next-generation fiber networks. And in the proceedings concerning the statutory classification and regulatory treatment of cable modem and DSL services, the Commission is seeking to create a more coherent and predictable framework for the regulation of broadband services. But these proceedings — as important as they are — will take us only so far. The true key to achieving Congress's objective of a deregulatory and procompetitive framework lies in moving beyond duopoly towards a world where *multiple* facilities-based providers compete in the broadband arena. Innovations such as broadband over power line systems hold great promise in bringing us closer towards fulfillment of that goal. Moreover, given the ubiquity of electric utilities, powerline technology should help extend broadband services to rural and other underserved areas. Together with exciting developments in the areas of wireless broadband services and two-way satellite services (which should be aided by today's item concerning satellite licensing reform), the maturation of broadband over power line technology is a cause for celebration.

**SEPARATE STATEMENT OF
COMMISSIONER MICHAEL J. COPPS**

RE: *Inquiry Regarding Carrier Current Systems, including Power Line Broadband Systems,
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Certainly we need to be quick about the task of gathering data, assessing the technical challenges and developing the requisite measurement procedures.

I believe, however, that it is also time to begin looking at some of the policy implications that we will surely face before power line broadband deployment becomes a reality. The implications of this technology are, in fact, wide-ranging, and to ask commenters to begin exploring how power line communications fit into, or challenge, our existing rules strikes me as both prudent and timely. Important questions include: How do we avoid cross-subsidy from a corporation's regulated energy businesses to its communications business and resulting price hikes for energy customers in non-competitive markets? What are the implications of power line communications to universal service? To rural communications? Are there pole attachment or rights-of-way issues we should address?

I am not suggesting that we need to answer these questions, and I am sure many others, right now. We do not have anywhere near enough information. But I believe that the FCC works best when it tackles the tough questions early on. If we ignore these issues now, we will just be pushing the challenge down the line for another Commission to deal with. And when they face the questions we didn't ask, they will not have the advantage of the time for reflection that we have now.

So I will vote to approve in part and to concur in part, and I look forward to working with the industry, the Bureau and my colleagues to nurture this exciting potential into early reality. It really might be a history-maker.

**SEPARATE STATEMENT OF
COMMISSIONER KEVIN J. MARTIN**

Re: *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems, Notice of Inquiry, ET Docket No. 03-104.*

I am pleased to support this item, which opens an inquiry into issues related to Broadband over Power Line (BPL) systems. BPL systems use existing electric power lines to provide high-speed communications. Because power lines are ubiquitous – reaching virtually every community and every home – BPL systems have the potential to become a last-mile solution throughout the United States. As such, they would not only provide competition to cable broadband and DSL, they could bring Internet access and high-speed broadband to rural and isolated areas, which have been difficult to serve because of the high infrastructure costs of reaching those areas. Moreover, BPL systems serve an important homeland security function, providing a redundant data network.

Having seen first hand a BPL system in operation, I am confident that this technology can achieve great things. Last week I visited a home in Maryland, where Current Technologies has established a demonstration site in cooperation with Potomac Electric Power Company. I came away truly impressed. Using BPL technology, I was able to watch a DVD quality movie, play a highly graphical interactive video game on the Internet, and print pages from a news web site on a printer in another room – all simultaneously. I was impressed not only with the speed, but also with the ease with which the home could be networked. Simply plugging a device into an electrical outlet enabled it to communicate with the other devices plugged into outlets in other rooms, as well as connect with the Internet. While I recognize that full scale commercial applications may not immediately achieve the speeds that I witnessed, it is clear this technology has significant potential.

I wish to emphasize that the inquiry we commence today should in no way slow down BPL deployment. Several companies have told me they can deploy BPL technology under our existing rules. I strongly support such efforts. This inquiry is meant to facilitate BPL technology. Whatever rule changes we ultimately make, if any, I expect those changes to complement existing efforts. Meanwhile, I look forward to receiving comments in this proceeding.

**STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN**

Re: *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems, Notice of Inquiry, ET Docket No. 03-104.*

The promise of Broadband over Power Line (BPL) systems is enormous. One of my top priorities as a Commissioner is to speed the deployment of broadband and other advanced services. I believe that the Commission must do what it can to extend the benefits of the latest broadband technologies – such as broadband over power line – to all Americans, whether they live in the inner city, the suburbs, or rural areas. I am encouraged that there already are several BPL experiments underway across the country, and that we are initiating this proceeding to ask questions and explore what further changes to our Part 15 rules may be necessary to facilitate the further deployment of this exciting technology.

I recently outlined an approach to spectrum management that promotes continued industry development, employs a light regulatory touch, and recognizes the unique traits of the electromagnetic radio spectrum as a national resource. While power line broadband may not fall within the traditional scope of spectrum management, BPL systems use existing electrical power lines as a transmission medium to provide communications by coupling RF energy onto the power line. Thus, I believe that while we must be mindful of harmful interference, we cannot let unsupported claims stand in the way of such an innovation as BPL systems. Provided that the engineering bears out, I believe that we need to push the boundaries to accommodate new technologies. A little noticed provision of the Communications Act, Section 157, reads that “[i]t shall be the policy of the United States to encourage the provision of new technologies and services to the public.” I am fully committed to that mission to promote new technologies, and to provide a framework for innovation so they can succeed.

For these reasons, the Commission’s goal must be to achieve the greatest amount of bandwidth for the greatest number of people – today we take an important step in furthering that goal. I look forward to reviewing the record in this proceeding to learn more about the ability of BPL systems to offer new avenues for broadband services.

Finally, I very much appreciate the interest in including questions in the NOI that address universal service, competition, and other policy issues that may be associated with the provision of broadband over power line. However, the technology still is in the earliest stages of development and testing, and the NOI was drafted with the sole focus of addressing the technical issues associated with BPL systems, not the policy ones. This item does not seem the right place to tackle these important questions. I will support revisiting these non-technical issues once the Commission gets a better understanding of the technology and associated deployment of BPL systems.

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Finally, I very much appreciate the interest in including questions in the NOI that address universal service, competition, and other policy issues that may be associated with the provision of broadband over power line. However, the technology still is in the earliest stages of development and testing, and the NOI was drafted with the sole focus of addressing the technical issues associated with BPL systems, not the policy ones. This item does not seem the right place to tackle these important questions. I will support revisiting these non-technical issues once the Commission gets a better understanding of the technology and associated deployment of BPL systems.

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We could be making some history here this morning. We could be on the cusp of bringing new competition to the deployment of broadband and doing so via technology with tremendous potential to reach not only the easily reachable, but also our hard-to-reach fellow citizens living in rural areas. Electric power infrastructure is near ubiquitous across the country and turning this asset into a powerful new communications technology could bring huge benefits to all of us. We're not there yet, of course, but just catching a glimpse of what this could mean in terms of the great broadband infrastructure challenge of the 21st Century is exciting. So I strongly support today's NOI, and I applaud the effort to gather information critical to assisting the Commission to play a constructive role in making this a reality without causing problems, such as unacceptable interference, to existing radio devices.

Certainly we need to be quick about the task of gathering data, assessing the technical challenges and developing the requisite measurement procedures.

I believe, however, that it is also time to begin looking at some of the policy implications that we will surely face before power line broadband deployment becomes a reality. The implications of this technology are, in fact, wide-ranging, and to ask commenters to begin exploring how power line communications fit into, or challenge, our existing rules strikes me as both prudent and timely. Important questions include: How do we avoid cross-subsidy from a corporation's regulated energy businesses to its communications business and resulting price hikes for energy customers in non-competitive markets? What are the implications of power line communications to universal service? To rural communications? Are there pole attachment or rights-of-way issues we should address?

I am not suggesting that we need to answer these questions, and I am sure many others, right now. We do not have anywhere near enough information. But I believe that the FCC works best when it tackles the tough questions early on. If we ignore these issues now, we will just be pushing the challenge down the line for another Commission to deal with. And when they face the questions we didn't ask, they will not have the advantage of the time for reflection that we have now.

So I will vote to approve in part and to concur in part, and I look forward to working with the industry, the Bureau and my colleagues to nurture this exciting potential into early reality. It really might be a history-maker.

**SEPARATE STATEMENT OF
COMMISSIONER KEVIN J. MARTIN**

Re: *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems, Notice of Inquiry, ET Docket No. 03-104.*

I am pleased to support this item, which opens an inquiry into issues related to Broadband over Power Line (BPL) systems. BPL systems use existing electric power lines to provide high-speed communications. Because power lines are ubiquitous – reaching virtually every community and every home – BPL systems have the potential to become a last-mile solution throughout the United States. As such, they would not only provide competition to cable broadband and DSL, they could bring Internet access and high-speed broadband to rural and isolated areas, which have been difficult to serve because of the high infrastructure costs of reaching those areas. Moreover, BPL systems serve an important homeland security function, providing a redundant data network.

Having seen first hand a BPL system in operation, I am confident that this technology can achieve great things. Last week I visited a home in Maryland, where Current Technologies has established a demonstration site in cooperation with Potomac Electric Power Company. I came away truly impressed. Using BPL technology, I was able to watch a DVD quality movie, play a highly graphical interactive video game on the Internet, and print pages from a news web site on a printer in another room – all simultaneously. I was impressed not only with the speed, but also with the ease with which the home could be networked. Simply plugging a device into an electrical outlet enabled it to communicate with the other devices plugged into outlets in other rooms, as well as connect with the Internet. While I recognize that full scale commercial applications may not immediately achieve the speeds that I witnessed, it is clear this technology has significant potential.

I wish to emphasize that the inquiry we commence today should in no way slow down BPL deployment. Several companies have told me they can deploy BPL technology under our existing rules. I strongly support such efforts. This inquiry is meant to facilitate BPL technology. Whatever rule changes we ultimately make, if any, I expect those changes to complement existing efforts. Meanwhile, I look forward to receiving comments in this proceeding.